North-German Lowlands (Potsdam), so that Borkum and Potsdam are much "colder" for man than Davos, although the latter shows on the average a considerably lower atmospheric temperature. The conclusion drawn by Dorno, however, that the climate of Davos as regards heat-production makes a smaller demand on the human body than the most sheltered places north of the Alps, is too general.

It is just as inadequate to take only average values in ascertaining cooling power as a measure of intensity of stimulus, since a number of secondary cooling factors of importance to the physician may be overlooked. In this case also it would be most useful to work out the frequency with which the limits are passed, and to represent this graphically as shown in the accompanying graph. On the axis of X the number of hours is marked off; on the axis of Y the limits of cooling power in $\frac{1}{1,000}$ gram-calories per sq. cm. per second. This example taken at random shows for how many hours in any given month the cooling power lies between certain limits in a given locality. Herein it would be advisable to omit the hours of the night when hardly any people, especially patients, remain in the open. In the half-year from October 1 to March 31 one should perhaps make use of observations made between 7 a. m. and 7 p. m.; in the other half-year those between 6 a. m. and 8 p. m. These observations are recorded on the supposition that the meteorological elements composing the cooling power are registered continuously. It is also of special importance to medical men that the observation shall be made where the patients are actually living. This holds good less for measurements of sun-radiation and all those elements which only vary in intensity with considerable change of locality, than for observations of atmospheric temperature, since it is not possible to find an observation-point in every district which could be regarded as representative of atmospheres more remote; yet still more important is it for measurements of the wind, the sphere of influence of which is exceedingly limited. The researches of Hellmann and A. Peppler on wind-measurements carried out from the radio towers at Nauen and Eilvese, have shown that in the lower 16 meters, over level ground, the velocity of the wind increases considerably with the altitude; whereas in higher altitudes the increase in velocity is only very slight. From this, for the purposes of general meteorology and climatology the inference was doubtlessly correctly drawn that the measuring apparatus should be allowed to reach the atmospheric layers above 16 meters, since beyond this any difference in the height of the apparatus is of little consequence. It is, however, obvious that data concerning wind-velocities measured at a height of several meters above the roof level of any locality, and also cooling powers deduced from such measurements, are of no value to the physician. Similarly, Dorno's comparisons of cooling powers for different places lose in value since they are built partly on observations made at places never visited by patients. In health resorts, wind measurements and observations of cooling power should be made on *such* promenades and resting places as are chosen by patients. Of course, in order to fulfill the requirement of obtaining strict comparison between observations for different places, so important for the physician, it will not be possible to avoid making parallel measurements within the same district. It is also necessary to choose localities for observation with especial care, and describe them with minute accuracy.

FATA MORGANA ON THE NAGYHORTOBÁGY.

By DR. ANTONY RÉTHLY.

[Budapest, Hungary, May 31, 1923.]

Upon the occasion of my visit to Nagyhortobágy for the purpose of setting up a meteorological station, while talking with the wife of the meteorological observer, Adalbert Rácz, on June 7, 1922, I mentioned how much I regretted that, up to that time, I had had no opportunity of seeing a fata morgana. She replied that if I had told her so that morning, she could have shown me one, for just that morning had been an exceptionally fine phenomenon of this kind. But I might be assured, she said, that there would be one the following day. Upon asking for more details she told me that this phenomenon can be seen almost every day, if there is no rain. It is a continually moving sight, changing its place every moment, the objects run away, then return, suddenly disappear and reappear larger than before. To my remark "There is too strong a wind to-day", she answered "That's nothing, the better and more interesting it is." My expectation was aroused, I was quite incredulous, and I asked her to relate more particulars about the phenomenon, whereupon the lady invited me to go to the railway and look over the region.

Standing on the railway at 6 o'clock in the afternoon she showed me the whole panarama in order that I might see the region *when there was no fata morgana*. I observed the horizon with the unaided eye from ESE, to W. On the lower part of the annexed sketch (fig. 1) I reproduce what I saw. The view was thoroughly calm without trace of atmospheric unrest or of inverted images.

On the morning of June 8, I was occupied with the installation of the meteorological station. At noon I

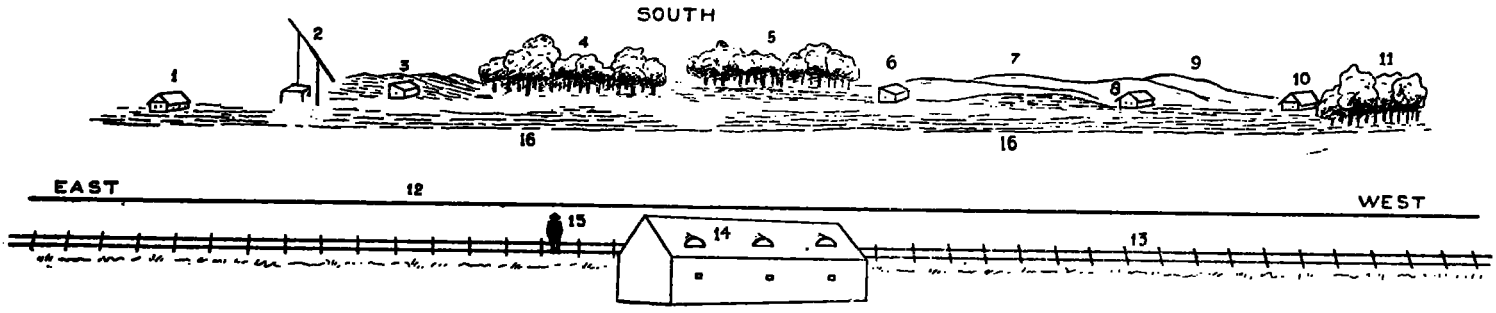

FIG. 1.—Sketch of the fata morgana on the Hortobágy. Explanation: (1), (3), (6), (8), (10) are huts; (2), a well;(4), (5), and (11), woods; (7) and (9), hills; (12), horizon; (13), railway;(14), a granary; (15), point of observation: (16), apparent water surface;.

(To face p. 312.)

FIG. 2.—Photograph of the fata morgana on the Hortobágy Plain in Hungary. (Photographed by W. G. v. Harangky.)

went out to the railway in order to see the region observed the previous evening. I did not go out with great expectation, because the sky was rather cloudy and the weather very windy. To my great surprise, however, I could observe an exceptionally fine specimen of fata morgana. It was beyond my expectations in every respect. About a third of the sky was covered with cumulus clouds. The wind blew from north with a force of 3 (Beaufort scale), while it had been continually north, force 3 to 4, in the morning.

Observing the horizon from east through south to west, I saw all objects elevated and in great unrest. (Upper part of fig. 1.) At several places water surfaces appeared in lively movement; for example, immediately behind hut No. 3, as well as half way between this hut and the spot where I was standing. Also before wood No. 5 a water surface appeared and the wood was somewhat raised above it. The fata morgana was intense, particularly in that part of the horizon which was east of the sun, but it was most intense in the direction of solar vertical. The fata morgana extended thus over the whole southern horizon, but its most intense part moved with the sun. I observed this on several occasions, at noon, at 1.30 p. m. and 4 p. m., when, in the east, the mirage was much weaker.

At 4 o'clock in the afternoon I saw a water surface in agitation. Waves moved from west to southeast, and they were so large and the mirage was so intense that at times the *huts and hills appearing on an elevated position* behind the water surface disappeared. Hill No. 9 was not visible during the whole time. Wood No. 11 was extraordinarily interesting. From time to time parts of this wood disappeared and reappeared again, and the trees seemed to move from west to southeast. A double wavy movement could be discerned; one component up and down and one approaching to, and receding from, the observer. Of all objects, wood No. 11 was lifted most, and behind it at a considerably greater distance I saw the church of Etyek aloft.

Beside the water surfaces mentioned, along the whole horizon, a large coherent water surface No. 16, appeared. Before wood No. 5 there was also a small water surface, behind which the wood detached from the ground, was standing entirely in the air. I estimated the elevation at least as high as the tree tops. No inverted image could be observed.

Before hill No. 7 there was a moving water surface. The hill itself showed a sight like that of the rising sun or moon when it is stretched out and extends at the side.[3] I saw this in the morning as well as in the afternoon, but it was more intense in the afternoon.

[3] Like Figure 37/c of Pernter's *Meteorologische Optik*, if we imagine the image of the sun, with its reflected image.

Looking northward I could distinctly discern St. Margaret's church, the mountain district of Tokaj, Eger, and Gyöngyös, and even with my feeble eyes I could see the sharp contours. But no fata morgana was visible in this direction.

About noon a herd of horses was driven to the draw well 2. When the horses traveled in procession, from time to time one or another of them, or the herdsman himself, disappeared for a moment, and I saw them at times farther forward or farther backward. It was a true cinema picture, rendered more complicated by the approach of the herd. Upon arriving at the watering trough near the well, the horses advanced like waves, then backed, then disappeared again. The herdsman with his horse also seemed to make an undulating movement, whereas in reality he stood at the same spot near the well; at times he seemed to move toward the east with the well for about two horse-lengths; at other times I saw him apparently farther back. This wavy movement was like that of wood No. 11—a very surprising phenomenon. After 2 o'clock the herd left the water trough, the receding horses disappearing for some moments only to reappear again higher or lower, but I could not discern an inverted image of any object during the entire day. At 7 o'clock in the evening the phenomenon was very weak, the water surfaces disappeared slowly, and the calm view of the Hortobágy appeared once more.

Mrs. Adalbert Rácz did not consider the phenomenon described above as of the finest. I consider it as a very interesting fact that on this day there was a lively wind (force 3), at times even stronger than force 4. The temperature was not exceedingly high, 82.4° F. (28.0° C.), and in course of the day the cloudiness increased until three to four-tenths of the sky was covered.

According to the records of the meteorological station at Nagyhortobágy from June 7 to July 31, fata morgana was observed on the following dates:

June 7 and 9	Very fine.
July 22 and 30	Do.
June 8, 18, 21, and 23	Fine.
July 21 and 31	Do.
June 12, 24, 25, and 30	Fair.
July 2, 3, 4, 5, 6, 10, 20, and 29	Do.

The fata morgana of July 22 was extraordinarily fine and lasted from 9 a. m. to 6 p. m. with a maximum temperature of 86° F. (30.0° C.), feeble east wind, relative humidity 25 per cent.

On July 30 from 10 a. m. to 5 p. m. a splendid fata morgana was seen, highest temperature 76.1° F. (24.5° C.), partly dull weather, brisk north wind, relative humidity 39 per cent.

MIRAGE IN LOWER CALIFORNIA.

Below is an account of a mirage seen by Observer James H. Gordon while on a trip to Lower California from Yuma, Ariz., his station, on June 26, 27, 1923:

"From Volcano Lake return was made to Mexicali for directions to reach Laguna Salada. Laguna Salada is a little known feature of this country. At its best it is a salt lake some seventy miles long and ten or twelve wide at the widest part. At its worst we judge it is a great salt flat of the same dimensions. It is fed by the drainage from the east slope of the Coast Range and the west slope of the Cocopahs and also, it is said, by occasional inflow from the Colorado at high water and from the Gulf at very high tides. Perhaps I should say that it lies in a valley hardly bigger than itself, with the Coast Range on the west and the Cocopahs on the east. We had little difficulty in finding it. Coming over a saddle in the Cocopah Range, the Laguna Salada springs into view. As we saw it there was a fringe of white salt flat a mile to a mile and a half wide about a very blue lake that stretched away farther into the south than we could follow. Far to the south there was much mirage, floating mountains with the inverted image below, distorted shore lines, etc. But the lake was a lake, unquestionably.

"This view was from a point fully two hundred feet above the lake bed. We drove down to the northern end